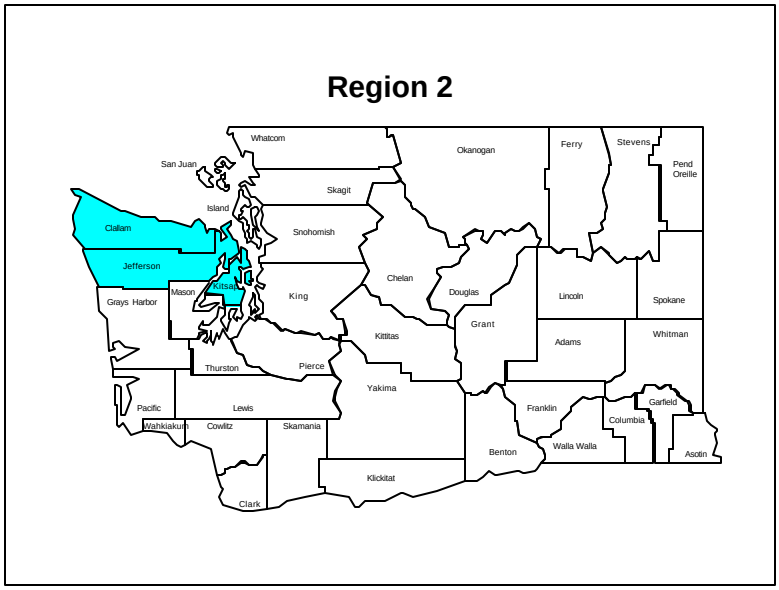
Region 2

Region 2 includes the counties of Clallam, Jefferson, and Kitsap on the northern half of the Olympic Peninsula in northwest Washington.

The terrain is varied, as the region is surrounded by water on three sides, and the Olympic Mountains rise in its interior. Most of the population lives in communities along the shorelines of the Pacific Coast, Strait of Juan de Fuca and Puget Sound. Just over 5 percent of the state's population lives in Region 2.

The population is less diverse than the state as a whole. Clallam and Jefferson Counties in recent years have become a haven for retirees and have significant populations over the age of 65. The share of younger workers in Jefferson County declined in recent years, as young people left the county to seek employment elsewhere. Without the substantial number of people moving into Clallam and Jefferson Counties in the 1990s, their populations would have declined.



The economy of the region is mixed and evolving. Clallam and Jefferson Counties now depend on trade and services sectors catering to tourists and their aging populations; previously, timber and related industries provided the bulk of available jobs. Kitsap County is heavily dependent on the military, and has been for decades. A significant percentage of Kitsap County residents commute to jobs on the eastern side of Puget Sound via the state ferry system.

The Counties

Clallam County[1]

Clallam County, with an area of 1,745 square miles, is 20th in size among Washington's 39 counties.

The county's population in 2000 was 64,525, making it the 17th largest of Washington's 39 counties. Six of every ten residents live in unincorporated areas. From 1990 to 2000, the population grew about 14.8 percent, only about two-thirds as fast as the state. More than 100 percent of Clallam County's growth was due to people moving into the county; if not for in-migration, the population would have declined. The unusual ratio of migration to natural increase reflects the elderly nature of the community. The county's population density is 37 residents per square mile, ranking 18th in the state.

Clallam County has three incorporated cities, Port Angeles, with just over a quarter of the county's population, Forks, and Sequim. There are five Native American Indian Reservations in Clallam County – the Makah Indian Reservation at Neah Bay, Ozette Indian Reservation on the county's central shoreline, the Quileute Indian Reservation near La Push, the Elwha Indian Reservation near Port Angeles, and the Jamestown Indian Reservation near Sequim Bay. The Native American percentage of the county's population far exceeds that of the state.

The varied terrain of Clallam County is some of the most scenic in the country. The county's Pacific coastline has rugged and windswept beaches, bays, terraces and deltas; the county's northern shore is similar. Along the Bogachiel River in southwest Clallam County, thick jungles of evergreens and undergrowth form non-tropical rain forests at the base of the Olympic Mountains. From the coast, the terrain ascends rapidly as it reaches the Olympics, which climb to about 7,000 feet above sea level. Within this range lie Mount Carrie, 6,995 feet, and Hurricane Ridge, about 5,700 feet, the highest elevations in the county.

Situated on the northern extension of the Olympic Peninsula, water surrounds about half of Clallam County. To its north and west lie the Strait of Juan de Fuca and Pacific Ocean, respectively. Further north across the Strait is Vancouver Island, British Columbia. The county shares its only land-bound border with Jefferson County to the south and east. About half of Clallam County, including most of its Pacific shoreline, is part of the Olympic National Park or Olympic National Forest.

Clallam County's economy was built on lumber and wood products, and paper and allied products, and that continues today. The Olympic Peninsula's climate and topography provide favorable growing conditions for forests, but protection of endangered species has and will continue to impact activity in these industries.

The county is becoming a retirement center; in recent years, the number of retirees moving to this area has risen dramatically. A comfortable climate, particularly around the Sequim area, coupled with a relatively low cost of living is attractive to retirees. Growth in trade and services, much of it catering to an older population, has moved these sectors to the forefront of the county's economy, with jobs stemming directly from tourism fast approaching the job count in manufacturing.

Clallam County in 2003 was designated a distressed area because its rate of unemployment was at least 20 percent greater than the state's from 2000 through 2002. It is the only county so designated in Region 2.

Jefferson County[2]

Jefferson County has an area of 1,808 square miles, 18th largest in the state.

Its population was 25,953 in 2000, a 27 percent increase since 1990. Growth in the county's population is due exclusively to people moving into the county. More than 14 people live per square mile, making the county the 29th most densely populated in the state.

Jefferson County has only one incorporated city, Port Townsend; one in every three county residents lives there. Most of the remaining population lives along Puget Sound in the communities of Irondale, Port Hadlock, Port Ludlow, Quilcene, and Center. There are three small communities on the Pacific Coast – Kalaloch, Queets, and Clearwater.

The county is in the upper half of the Olympic Peninsula in northwest Washington. It is bounded on the north by Clallam County, on the south by Grays Harbor and Mason counties, on the west by the Pacific Ocean, and on the east by Hood Canal and Kitsap County.

Jefferson County's topography is a mix of highlands and lowlands. The highlands are mostly rugged, mountainous terrain covered by dense stands of Douglas fir. About three-quarters of the county is within the Olympic National Park and Olympic National Forest. The Olympic Mountains run through the middle of the county. The highest peaks include Mount Olympus, 7,965 feet; Mount Constance, 7,743 feet; Mount Anderson, 7,321 feet; and Mount Seattle, 6,246 feet.

Jefferson County's lowlands exist at its western and eastern reaches where land meets water. The county's western shore – also part of the Olympic National Park system – is among the peninsula's most scenic. The windswept coastline features rock formations set amid the surf and pebbly beaches; just offshore is an array of tidelands teeming with shellfish and waterfowl. The western shore also is where the county's three principal rivers, the Hoh, Queets, and Clearwater, flow into the Pacific.

The lower half of Jefferson County's eastern shoreline is part of the Olympic National Forest; the land is forested as it runs to the edge of Hood Canal. The upper half of the shore, particularly where it extends into Admiralty Inlet, is characterized by many inlets with steep and rocky cliffs. Offering protection from the elements are several deep-water harbors. The main rivers in the eastern half of the county are the Dosewallips, Duckabush, Quilcene, and Little Quilcene Rivers.

Jefferson County's economy has evolved from one dependent on timber to one more diversified. As recently as 1993, the major employers in the county were associated with timber. In 1998, the economy, measured in terms of the largest employers, revolved around local government, food service, paper and allied products, tourism and recreation, and services such as legal and health services.

Younger workers are leaving and older workers and retirees are moving to the county; the aging population of Jefferson County is the reason for and the driver behind the changing economy.

Kitsap County[3]

Kitsap County, with an area of 393 square miles, is 36th in size among Washington's 39 counties.

Kitsap County's population was 231,969 in 2000, fifth largest in the state. Of the population gain in the 1990s, 55 percent was from people moving into the county. Only 30 percent of residents live in incorporated areas. Bremerton is the largest city, with half the incorporated population. Other cities in Kitsap County are Bainbridge Island, Port Orchard and Poulsbo. Population density is 580 people per square mile, making the county the second most densely populated.

The county is along the western shore of the Puget Sound. Because of its relatively water-bound situation, Kitsap County is connected only to Mason and Pierce Counties by virtue of a land bridge at its south edge. To the north of Kitsap County across Admiralty Inlet, at the mouth of Puget Sound, is Island County; to its east across Puget Sound are parts of King, Pierce and Snohomish counties.

Kitsap County's terrain has low, rolling hills and flat-topped ridges and plateaus. Inlets, lakes, and valleys separate inland areas. The county's shoreline is generally one of moderate to steep irregular cliffs.

Few sectors have had as great an employment and economic impact on Kitsap County as the military, specifically the U.S. Navy. Development of naval bases began in the late 1800s; the county is home to the Puget Sound Naval Shipyard in Bremerton, Naval Submarine Base – Bangor, the Naval Undersea Warfare Engineering Station in Keyport, the Naval Hospital in Bremerton, and the Naval Supply Center – Puget Sound. The county's healthy trade and service sectors cater largely to defense contractors, active-duty and retired military personnel, federal civilian employees, and their respective families.

Population and Demographics

As shown in Table 1 below, Region 2's population grew at about the same rate as the state as a whole during the 1990s; Jefferson County grew much faster, and Clallam County grew more slowly. The region's growth rate is expected to continue to closely parallel that of the state through the year 2025, with Jefferson County's population expected to grow much faster.

Table 1. Population Growth

	1990 Population	2000 Population	% Change	2025 (Projected)	% Change from 2000
Clallam	56,204	64,525	14.8%	77,749	20.4%
Jefferson	20,406	25,953	27.1%	40,807	57.2%
Kitsap	189,731	231,969	22.3%	331,571	42.9%
Total	**266,341**	**322,447**	**21.0%**	**450,127**	**39.6%**
Washington State	*4,866,663*	*5,894,121*	*21.1%*	*7,975,471*	*35.3%*

Source: U.S. Census Bureau, Census 2000; *2002 Population Trends*, State of Washington Office of Financial Management, Forecasting Division; *Washington State County Population Projections For Growth Management*, Intermediate Projection, State of Washington Office of Financial Management, Forecasting Division, January 2002.

Four of every five residents live in highly urbanized areas, about the same as the state average; see Table 2, below. Most of Kitsap County's residents live in urban areas, while Clallam and Jefferson Counties' residents are divided between urban and rural areas. The current growth pattern, both urban and rural, affects how agencies prepare for emergencies as changes in the population and development can increase risks associated with hazards.

Table 2. Urban/Rural Populations, 2000

	Urban	Rural
Clallam	33,794	30,731
Jefferson	11,589	14,364
Kitsap	186,096	45,873
Total	**231,479**	**90,968**
Percentage	80.2%	19.8%
Washington State	*81.9%*	*18.1%*

Source: U.S. Census Bureau, Census 2000: Population and Housing by Urban Classification.

The ability to prepare for and recover from a disaster varies among population groups. Research on various population groups and disasters found that it took some populations longer to recover from a disaster for a variety of reasons. These population groups include minorities, people with language barriers, the disabled, the elderly, and those with low income.

Ethnic Groups

People from non-white population groups generally experience longer recoveries due to lower incomes, savings and insurance; their difficulty accessing insurance; and their using aid and relief organizations differently than was anticipated. Language and cultural differences can pose difficulties in some populations' understanding and implementing preparedness and mitigation actions as well as accessing and using available disaster relief.

Table 3, below, shows that Region 2, overall, is less diverse than the state as a whole. Clallam County has a significant Native American population, while Kitsap County has significant Hispanic and Asian populations.

Table 3. Population by Ethnic Group

	Hispanic/ Latino	Asian	African American	Native American	Total
Clallam	3.4%	1.1%	0.8%	5.1%	10.4%
Jefferson	2.1%	1.2%	0.4%	2.3%	6.0%
Kitsap	4.1%	4.4%	2.9%	1.6%	13.0%
Washington State	*7.5%*	*5.5%*	*3.2%*	*1.6%*	*17.8%*

Source: U.S. Census Bureau, Census 2000.

Even though Region 2 is not as diverse as the state, a sizable percentage of its population does not speak English as its primary language at home and speaks English less than very well, as shown in Table 4, below. This means that a percentage of the population may have a language barrier that prevents them from preparing for a disaster, responding to an event, or applying for assistance after a disaster.

Table 4. Primary Language Spoken at Home

	Language Other Than English	*English Less Than Very Well*	Spanish	*English Less Than Very Well*	Other Indo-European	*English Less Than Very Well*	Asian-Pacific Islander	*English Less Than Very Well*
Clallam	**6.3%**	**2.3%**	3.2%	1.5%	1.5%	0.3%	0.9%	0.4%
Jefferson	**4.0%**	**1.5%**	1.0%	0.4%	1.9%	0.5%	0.8%	0.4%
Kitsap	**8.3%**	**2.4%**	2.5%	0.7%	1.8%	0.3%	3.8%	1.4%
Washington State	***14.0%***	***6.4%***	*5.8%*	*2.8%*	*3.2%*	*1.3%*	*4.4%*	*2.2%*

Source: U.S. Census Bureau, Profile of Selected Social Characteristics: 2000

Disabled People

People with disabilities often are left out of community preparedness activities for a disaster. They have complex challenges because of hearing, sight, mobility, or mental impairments. Additionally, a significant percentage of working-age people with disabilities do not work. These factors make it difficult for the disabled to prepare in advance of a disaster.

Table 5, below, shows that about one in four people in Clallam County of working age has a disability that does not require them to be institutionalized, and only about half of them are employed; the percentage of Jefferson and Kitsap Counties' populations with a disability is slightly less than the state's average. About 40 percent of retirement-age people in the region have a disability.

Table 5. Non-Institutionalized Disabled Population

	21 to 64 Years		65 Years and Older
	% of Population	% Employed	% of Population
Clallam	23.0%	48.6%	38.4%
Jefferson	16.3%	53.5%	33.9%
Kitsap	18.1%	52.7%	43.1%
Washington State	*17.7%*	*57.6%*	*42.3%*

Source: U.S. Census Bureau, Profile of Selected Social Characteristics: 2000.

Elderly People

The elderly may be overlooked in preparedness and recovery activities; their age could lead them to have trouble after a disaster, perhaps not qualify for loans, or become

disabled because of the disaster. Table 6 shows about one of every five people living in Clallam and Jefferson Counties is over 65, which confirms them as a haven for retirees; Kitsap County's retiree-age population is slightly smaller than the state as a whole.

Table 6. Population Over Age 65

	% of Total Population
Clallam	21.3%
Jefferson	21.1%
Kitsap	10.6%
Washington State	*11.2%*

Source: U.S. Census Bureau, Census 2000

Poverty

The amount of money people have influences what type of housing they live in, whether they can engage in mitigation actions, and how long it takes them to recover. Income is based on a number of factors, including the individual, the economy, availability of jobs, educational opportunity, among others. Expenses can vary by location – rural places are cheaper to live but have fewer jobs, while urban areas can be costly, even for renters.

Table 7, below, shows that Clallam and Jefferson Counties have a larger percentage of people living in poverty than the state as a whole. In the past 30 years, both have experienced a significant shift in their economies from well-paying manufacturing jobs, primarily in timber and related industries, to lower-paying trade and service sector jobs, and both have experienced significant growth in the number of retirement-age people drawing Social Security. Kitsap County, on the other hand, has a smaller percentage of people living in poverty, primarily because of the significant influence of well-paying government jobs.

Table 7. Poverty Rates

	% of Total Population	Children Under 18	Over Age 65
Clallam	12.5%	17.1%	6.8%
Jefferson	11.3%	16.6%	6.0%
Kitsap	8.8%	10.9%	6.0%
Washington State	*10.6%*	*13.2%*	*7.5%*

Source: U.S. Census Bureau, Profile of Selected Economic Characteristics: 2000.

School Children

While children overall are captured in figures elsewhere in this profile, the number of children attending school is a concern because many of the school buildings they spend considerable time in each day are older and potentially more vulnerable to the effects of disaster. Table 8, below, shows the population of school-age children in Region 2; it does not show the number that are in potentially vulnerable buildings.

Table 8. School Enrollment – Kindergarten through High School

	Total	Kindergarten	Elementary	High School
Clallam	11,058	772	6,518	3,768
Jefferson	3,934	223	2,406	1,305
Kitsap	46,929	3,318	29,067	14,544
Total	**61,975**	**4,313**	**37,991**	**19,617**
Washington State	*1,127,448*	*82,637*	*697,192*	*347,619*

Source: U.S. Census Bureau, Profile of Selected Social Characteristics: 2000.

Housing

Washington's Growth Management Act encourages local jurisdictions to direct population growth into urban growth areas, where growth and higher densities are expected and supported by urban services. It also requires communities to incorporate mitigation by protecting critical areas and restricting development in areas such as those that are frequently flooded or subject to geologic hazards. Eliminating or limiting development in hazard-prone areas can reduce vulnerability to hazards and the potential loss of life and injuries and property damage.

Table 9, below, provides a breakdown by county of various housing characteristics.

Table 9. Housing Development

	Single-Family	Multi-Family	Mobile Homes	Other
Clallam	70.9%	11.5%	16.6%	1.0%
Jefferson	73.8%	7.9%	15.4%	2.9%
Kitsap	70.1%	19.8%	9.6%	0.5%
Washington State	*65.4%*	*25.6%*	*8.5%*	*0.5%*

Source: U.S. Census Bureau, Profile of Selected Economic Characteristics: 2000.

The year housing was built is important for mitigation. The older a home is, the greater the risk of damage from natural disasters. Homes built after 1980 are more likely built

to current standards for hazards such as floods, high winds, snow loads, and earthquake. Table 10, below, shows the periods during which housing was built throughout the region. Overall, Region 2 has a slightly newer housing stock than the state as a whole because of its recent growth.

Table 10. Housing – Year Built

	Pre-1939 – 1959	1960 – 1979	1980 – 2000
Clallam	23.3%	37.5%	39.1%
Jefferson	21.3%	29.1%	49.6%
Kitsap	23.6%	30.5%	46.0%
Washington State	*29.4%*	*32.7%*	*37.9%*

Source: U.S. Census Bureau, Profile of Housing Characteristics 2000

Household Income

Median household income is an indicator of a region's economic stability. It can be used to compare economic areas as a whole, and it generally shows how income is distributed among the population. Median household income indicates that point where half of all households have a higher income, and half have a lower income.

Table 11, below, shows that median household incomes in Clallam and Jefferson Counties are less than the state average; they have large retirement populations and their economies have a significant percentage of jobs in the lower-paying trade and services sectors. Kitsap County's median household income is higher than the state average due to the significant government presence as well as high-paying services provided primarily by military contractors.

Table 11. Median Household Income

County	Year 1999
Clallam	$36,449
Jefferson	$37,869
Kitsap	$46,840
Washington State	*$44,776*

Source: U.S. Census Bureau, Profile of Selected Economic Characteristics: 2000

Employment and Industry

The economy of Region 2 is mixed. The forest products industry, dominant in Clallam and Jefferson Counties until the mid 1980s, has given way to trade and service related industries that serve the growing tourist trade and an aging population. Government employment has dominated Kitsap County's economy by for many years, primarily due to the significant Navy presence.

Below are brief descriptions of the economy and employment in the region's three counties.

Clallam County

Trade, with one in four jobs, is the largest sector of the Clallam County employment. Eating and drinking establishments employ the largest share of workers within the trade sector, with 31 percent of jobs.

Services is the second largest economic sector, again with about one in four of the county's jobs. It provides the lowest average salary. The largest industry within this sector is health services. The second largest industry is social services, with the largest share of workers employed in residential care facilities and individual and family social services. The Native American tribes, whose jobs are part of this sector, employ a comparatively higher number of workers than the state average.

Clallam County has a relatively low share of its employment in manufacturing, more than 9 percent, compared to more than 12 percent statewide. This sector accounts for about 13 percent of total wages in the county. The largest industry in manufacturing is lumber and wood products, with half of the employment in this sector. The second largest industry is paper and allied products, with 17 percent of jobs.

Public employment accounts for more employment in Clallam County than the state as a whole, about 25 percent, compared to 17 percent throughout the state. Local government, particularly K-12 education, provides the greatest number of jobs in this sector.

Jefferson County

Jefferson County has developed its economic base in recent years around tourism and retirement. This is a contrast to what had existed for many decades – a manufacturing sector based on timber and timber products.

Although the manufacturing sector provides about 12 percent of jobs, primarily in paper and allied products, its relative importance has fallen off in recent years. In 1970, manufacturing represented 35 percent of employment in the county. This is partly due to growth in other areas of the economy as well as industry restructuring and supply

restrictions. In its place have risen two dominant economic sectors – trade and services.

Trade's percentage of employment is about 26 percent of jobs, nearly doubling since 1970. Much of the growth has come in grocery stores, and eating and drinking establishments, primarily from the promotion of tourism and recreation. The services sector has doubled since 1970, to 24 percent in 1999. This sector has three important and growing industries: social services and health services, driven by the aging of the population, and lodging, resulting from the area becoming a prime tourist area on the Olympic Peninsula.

Government's share of employment dropped slightly from 1970 to 1999, from nearly 29 percent in 1970 to about 26 percent in 1999. The largest growth was in local government.

Construction and mining represents 11 percent of employment; the strength of the home building industry has sustained this sector.

Figures on personal income in Jefferson County shows that only 42 percent is earned, far less than the state's 69 percent. This reflects the aging of the population; an older population receives more transfer income in the form of retirement payments and Social Security, and greater investment income, than a younger population.

Kitsap County

Underlying Kitsap County's economy is government, more specifically, the federal government. It dwarfs all other sectors in terms of employment. Further, the government is an underwriter of the services sector because it contracts for much of its work. Public employment also has a tremendous influence on the trade sector; the government payroll funnels directly into retail activities throughout the county.

Thirty-six percent of all jobs in the county are government jobs. (If the military is included, 44 percent of employment would be with the government.) Although government's share of total employment has decreased from 62 to 37 percent during the past 30 years, it remains the big driver of the county's economy. Aside from a few sparsely populated counties and Thurston County, home of state government, Kitsap County's concentration of government workers is the highest of any county in the state.

In 2000, the Department of Defense employed nearly 13,000 civilians and stationed about 10,500 military personnel at the county's military installations.

Services is the second largest sector of county employment behind government, with 26 percent of jobs in 1999. It grew 600 percent from 1970, more than double the state's rate of 232 percent. The three largest industries are those with the highest average wages – health care, engineering and management services, and business services;

the latter two industries have significant employment because of work contracted to the Navy.

Trade has 22 percent of county employment. This sector did not grow in the late 1990s due to waning employment at the shipyard. The largest number of workers is in retail trade, specifically eating and drinking establishments.

Commuting Patterns[4, 5, 6]

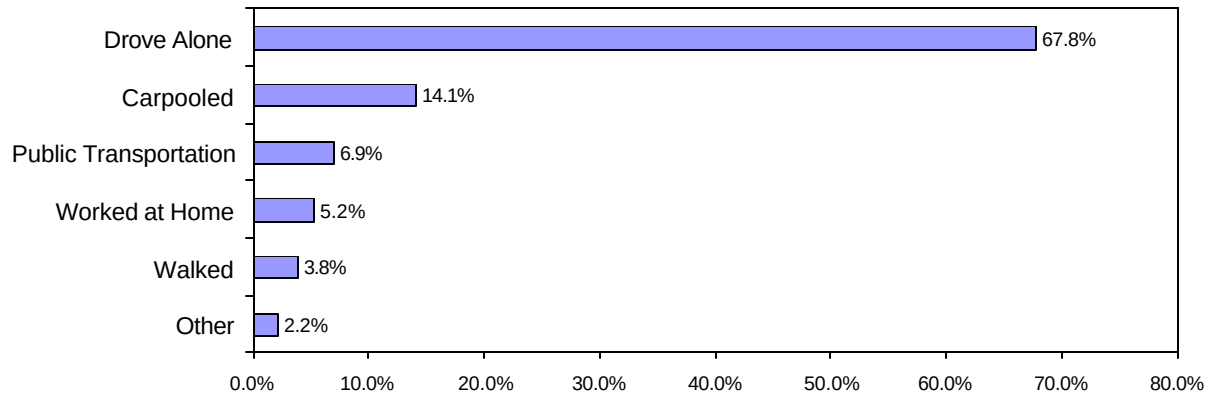
Recent population growth has resulted in a significant increase in workers, automobiles and trucks on the roads. A higher percentage of workers driving alone can cause traffic congestion and accidents. More traffic places a larger load on the region's transportation infrastructure. The impact of an emergency can disrupt automobile traffic, shut down transit systems, and make evacuations more difficult.

About 20 percent of Kitsap County residents commute to jobs in nearby counties; nearly all commute to King County (nearly 15,000), Pierce County (more than 5,100), or Snohomish County (about 1,250).

About 1,600 Jefferson County residents commute to jobs in nearby counties, and about 1,000 Clallam County residents commute.

Figure 1, below, shows transportation used by commuters. Primary mode of transportation is driving alone. Public transportation systems carried 4.2 million passengers in 2001, with Kitsap Transit carrying 3.4 million riders. The state ferry system carried 14.1 million passengers and 5.2 million vehicles between Kitsap County and the eastern shore of Puget Sound; a private contractor of Kitsap Transit carried another 228,000 riders on a passenger-only ferry between Bremerton and Port Orchard. Vanpools carried more than 185,000 passengers throughout the region.

Figure 1. Commuting Patterns



Source: U.S. Census Bureau, Profile of Selected Economic Characteristics: 2000

Hazards and State Facilities Potentially At-Risk

The regional hazard profiles were developed using information from the individual hazard profiles that are part of the Risk Assessment, as well as from reference documents listed at the end of each hazard profile.

Unless otherwise noted below, at-risk facilities were identified by state agencies participating in this plan using methodology identified in the Risk Assessment Introduction, page ___.

Figures for the number of staff/visitors/residents for each at risk facility were calculated on the highest use for that facility; for many structures on college and university campuses, this inflates the number of individuals in the buildings and on the campuses at any one time.

Additional data matching was completed with data sets for Earthquake, Flood, Volcano, and Wildland Fire, and results of that work are included in the facility summaries along side the state agency facility identification.

Western Washington University's building totals include counts for infrastructure including roads, utilities, walkways, telecommunications and other systems.

The Washington Department of Transportation identified essential transportation corridors, or highways and ferry routes of greatest importance to transportation of people and goods and services.

Data from the 2000 Census was matched against available hazard data sets to determine population at risk. Census data is for evening residential population; it does not reflect daily or hourly fluctuations related to commuting to and from the region by workers, shoppers, tourists or other transient populations.

Additional notes

Avalanche:

State agencies participating in this plan did not identify any facilities as being at risk to avalanche in Region 2. Additionally, GIS data sets are not available for avalanche that would allow for data matching with a state facility database.

Drought:

State agencies participating in this plan did not identify any facilities as being at risk to property damage by drought in Region 2, because drought's damage is primarily economic, financial and environmental. Additionally, GIS data sets are not available for drought that would allow for data matching with a state facility database.

Region 2

Earthquake:

The total at-risk building data was developed by matching data from a spreadsheet with information on facilities owned or operated by state agencies participating in this plan with a GIS data set for severe ground shaking [Peak Acceleration (percent gravity) with 10 percent probability of exceedance in 50 years, U.S. Geological Survey, October 2002]. Facilities in the area where ground shaking is expected to equal or exceed 30 percent of gravity were considered to be at high risk to earthquake. (Note: The analysis did not take into account on-site soil stability, which can increase or decrease the impact of ground shaking. Additional analysis is required in the future.)

Flood:

The total at-risk building data was developed by matching data from a spreadsheet with information on facilities owned or operated by state agencies participating in this plan with GIS data sets for 100-year floodplains.

Tsunami:

At risk population data prepared by the NOAA's National Tsunami Hazard Mitigation Program, based on populations within one kilometer of the coast.

Wildland fire:

Agency identified structures – State agencies participating in this plan identified facilities located in communities designed as being in the urban-wildfire interface and at greatest risk to wildland fire by the Department of Natural Resources.

GIS identified structures – The total at-risk building data was developed by matching data from a spreadsheet with information on facilities owned or operated by state agencies participating in this plan with a Department of Natural Resources GIS data set for jurisdictions in the urban-wildfire interface and at greatest risk to wildland fire

Hazard: Avalanche

Characteristics	Most Vulnerable Areas	Event History	Probability
Avalanches occur when a layer of snow loses its grip on a slope and slides downhill. They occur frequently in the backcountry of the Cascade Range, often without any impact to people, transportation routes or development. Most avalanches that cause injuries or deaths occur outside developed recreation areas; the primary cause of these avalanches is the weight of the victim or someone in the victim's party on the slab of snow. Very few avalanche fatalities occur in on open runs in ski areas or on highways. Avalanche season begins in November and runs through early summer for all mountain areas of the state; in high alpine areas of the Cascade Range, the season is year-round.	Much of the terrain of the Olympic Mountains is prone to avalanche, according to Olympic National Park web site. Hazard experts consulted for this plan did not identify areas vulnerable to avalanche in Region 2.	No reports of significant avalanches in Region 2 were found in research completed for this plan. The Olympic National Park web site noted an avalanche in March 1999 that covered Hurricane Ridge Road with up to 25 feet of snow; more than a dozen avalanches covered the road during 1999.	On average, avalanches kill one to two people every year in Washington State. No reports of avalanche deaths in Region 2 since 1910 were found in research completed for this plan.

Region 2

Hazard: Avalanche **At Risk Population**: Unknown of region total 322,447 **PRELIMINARY ASSESSMENT**

State Agency Structures At Risk Number and Function of Buildings	No. of Affected Staff / Visitors / Residents	Approx. Value of Owned Structures	Approx. Value of Contents All Structures
Total at-risk buildings: 0	0	0	0
Function of at-risk buildings:			
Total at-risk critical facilities: 0	0	0	0
Function of at-risk critical facilities:			

Hazard: Drought

Characteristics	Principal Sources	Event History	Probability
Drought is a prolonged period of dryness severe enough to reduce soil moisture, water and snow levels below the minimum necessary for sustaining plant, animal, and economic systems. Drought can have a widespread impact on the environment and the economy, depending upon its severity, although it typically does not result in loss of life or damage to property, as do other natural disasters. In Region 3, drought conditions can reduce water available for crops and domestic and industrial use, as well as affect the availability and cost of power for local industries.	Drought is the result of many causes, often synergistic in nature; these include global weather patterns that produce persistent, upper-level high-pressure systems along the West Coast with warm, dry air resulting in less precipitation.	During 1895-1995, much of the state was in severe or extreme drought at least 5 percent of the time. Region 3 was in severe or extreme drought from 5 to 10 percent of the time during this period. 1977 Drought – this region experienced severe or extreme drought conditions between 10 to 20 percent of the time during this event. 2001 Drought – at the height of the event in March 2001, much of this region experienced severe or extreme drought conditions.	In temperate regions of the world, including Washington state, current long-range forecasts of drought have limited reliability. Meteorologists do not believe that reliable forecasts are attainable any more than a season in advance. Drought conditions of at least moderate severity occur every few years in Washington. On a long-term basis, Region 3 experiences drought conditions of at least moderate severity from 5 to 10 percent of the time.

Region 2

Hazard: Drought **At Risk Population**: Unknown of region total 322,447 **PRELIMINARY ASSESSMENT**

State Agency Structures At Risk Number and Function of Buildings	No. of Affected Staff / Visitors / Residents	Approx. Value of Owned Structures	Approx. Value of Contents All Structures
Total at-risk buildings: 0	0	0	0
Function of at-risk buildings:			
Total at-risk critical facilities: 0	0	0	0
Function of at-risk critical facilities:			

Hazard: Earthquake

Characteristics	Principal Sources	Event History	Probability
In general, Seismic Hazard Areas in Region 2 are found in: • Areas near the Seattle fault in Kitsap County, and possible faults near Port Angeles. • Floodplains and the adjacent bluffs in the Dungeness, Elwha, Hoh, Quillayute, Queets, Sooes and Waatch River valleys because of their high or medium susceptibility to liquefaction and other ground failures. • Bluffs along shorelines, including those along the Pacific Coast, Puget Sound and Strait of Juan de Fuca because of their susceptibility to landslides and other ground failures.	1. Interplate earthquake in the offshore Cascadia Subduction Zone. Evidence of quakes with magnitude greater than 8 have been found along the Washington coast; the most recent event was about 1700. 2. Shallow, crustal earthquake in the North America (continental) plate. The western end of the Seattle fault begins in Kitsap County and runs east across Bainbridge Island and across Puget Sound. Other possible faults in the region are near Port Angeles. 3. Deep, Benioff zone earthquake within the Juan de Fuca plate. This is the source for the 1949, 1965, and 2001 earthquakes.	Since 1970, earthquakes of magnitude 4.0 or greater whose epicenter was in Region 2 occurred in 1974 (magnitude 4.0), 1975 (M4.0), 1978 (M4.8, M4.1), 1980 (M4.2), 1989 (M4.5, M 4.4), 1997 (M4.9), and 2003 (M4.8). The region received Presidential Disaster Declarations for the M6.5 Seattle-Tacoma earthquake in 1965 and the M6.8 Nisqually earthquake in 2001.	Approximate recurrence rate for a magnitude 9 earthquake in the Cascadia Subduction Zone is once every 350 to 500 years. Approximate recurrence rate for earthquakes similar to the 1965 magnitude 6.5 Seattle-Tacoma and 2001 magnitude 6.8 Nisqually events is once every 35 years. Approximate recurrence rate for earthquakes similar to the 1949 magnitude 7.1 Olympia event is once every 110 years. Approximate recurrence rate of a magnitude 6.5 or greater earthquake on the Seattle fault is about once every 1,000 years. Geologists have not yet developed recurrence rates for other surface faults found in Region 2.

Hazard: Earthquake **At Risk Population**: 261,406 of region total 322,447 **PRELIMINARY ASSESSMENT**

State Agency Structures At Risk Number and Function of Buildings	No. of Affected Staff / Visitors / Residents	Approx. Value of Owned Structures	Approx. Value of Contents All Structures
Total at-risk buildings: State Agency identified – 102	1,788	$1,158,516,470	$1,318,400,803
Function of at-risk buildings: Two state highways considered emphasis corridors are potentially at risk to earthquake: 1. US Highway 20, from Discovery Bay to Port Townsend. 2. US Highway 101, as it traverses the west, north and east shoulders of the region. Additionally, ferry landings for the Port Townsend – Keystone route are potentially at risk due to their construction on poor soils in shoreline areas.			
Total at-risk buildings: GIS identified facilities – 62	1,154	$50,566,105	$27,771,777
Function of at-risk buildings: Included are three driver licensing offices; eight state liquor stores; a 17-building campus housing a center for developmentally disabled individuals (est. 53 clients); campuses for the Olympic Natural Resource Center and Big Beef Creek center operated by the University of Washington; and a number of general government and client services offices.			
Total at-risk critical facilities: State Agency identified – 38	1,048	$18,642,476	$25,706,712
Function of at-risk critical facilities:			

Hazard: Flood

Characteristics	Principal Flood Sources	Event History	Probability
Region 2 is subject to two types of flooding – flooding that occurs on the county's major river systems (see right) and flooding that is the result of urbanization, particularly in small stream basins. Because of their origins in upper elevations, these rivers are influenced by snow and rain patterns in the Olympic Mountains; flooding is most likely to occur from November through February during periods of heavy rainfall and rapid snowmelt. All seven rivers travel through broad floodplains with long histories of flooding. Bank erosion is also a threat on the rivers.	1. Dungeness River 2. Elwha River 3. Hoh River 4. Quillayute River 5. Queets River 6. Sooes River 7. Waatch River	Flooding in Region 2 is a common event. Since 1956, flooding resulted in Presidential Disaster Declarations in 1982, 1986, 1990 (2 disasters), 1995 and 1997. Since 1989, more than $3 million in Stafford Act disaster assistance has been provided to Region 2 for repairs to public facilities following flood events.	The region's rivers typically flood every two to five years, but damaging flood events occur less frequently. Since 1956, this region has experienced a flood resulting in a Presidential Disaster Declaration about every eight years. Only about 2 percent of the area of the counties in Region 2 are in the 100-year floodplain.

Region 2

Hazard: Flood **At Risk Population**: 90,074 of region total 322,447 **PRELIMINARY ASSESSMENT**

State Agency Structures At Risk Number and Function of Buildings	No. of Affected Staff / Visitors / Residents	Approx. Value of Owned Structures	Approx. Value of Contents All Structures
Total at-risk buildings: 10	122	$5,344,473	$1,235,656
Function of at-risk buildings:			
Total at-risk critical facilities: 5	102	$115,000	$1,067867
Function of at-risk critical facilities:			

Hazard: Landslide

Characteristics	Principal Sources	Event History	Probability
Region 2 is part of two landslide provinces. Puget Lowland province – Unconsolidated material overlies the bedrock of much of the Puget Lowland. The lowland bluffs are susceptible to landslides because of their steepness, abundant rainfall and resulting groundwater, and contrasts in permeability of materials. Four landslides affect these bluffs: slumps, debris flows, ancient landslides in unconsolidated materials, and submarine landslides. Olympic Mountains province – Underlain by sedimentary and volcanic rocks, the Olympic Mountains have both slope stability conditions and a variety of landslide types that occur throughout the state. In lower valleys without glaciers, earth flows are extensive. Recently glaciated valleys that penetrate core rocks have small rock falls. Slopes undercut by wave action along the Strait of Juan de Fuca experience extensive slumps and earth flows or block slides.	1. Bluffs along shorelines of the Strait of Juan de Fuca and Puget Sound. 2. Olympic Mountains.	Examples of recent landslides in Region 2: December 1996-January 1997 Holiday Storms and Landslides Disaster – Kitsap County experienced a number of landslides ranging from small to large. The most significant, a debris flow on Bainbridge Island at Rolling Bay Walk, killed a family of four in their house at the foot of a bluff on Puget Sound. Additional slides on Rolling Bay Walk occurred in March, damaging three other homes. February 2001, Nisqually Earthquake Disaster – Both lanes of State Route 302 near Allyn, Kitsap County, dropped 18-24 inches through a landslide area. An artificial fill along a highway near Port Orchard slumped and displaced a highway 24 inches.	Ground failures that result in landslides have a number of contributing factors that do not allow for the development of a reasonable estimate probability of future events. Factors that contribute to ground failure and landslides include: • Local topography. • Erosion on slopes. • Saturation of slopes. • Earthquakes. • Volcanic deposits and debris flows. • Excess weight on weak slopes. • Human action that disturbs slopes.

Region 2

Hazard: Landslide **At Risk Population**: Unknown of region total 322,447 **PRELIMINARY ASSESSMENT**

State Agency Structures At Risk Number and Function of Buildings	No. of Affected Staff / Visitors / Residents	Approx. Value of Owned Structures	Approx. Value of Contents All Structures
Total at-risk buildings: 32	580	$2,793,955	$5,519,764
Function of at-risk buildings:			
Total at-risk critical facilities: 12	431	$172,500	$3,631,564
Function of at-risk critical facilities:			

Hazard: Severe Storm

Characteristics	Principal Sources	Event History	Probability
A severe storm is an atmospheric disturbance that results in one or more of the following phenomena: strong winds and large hail, thunderstorms, tornados, rain, snow, or other mixed precipitation. Most storms move into Washington from the Pacific Ocean. Typically, major impacts from a severe storm are to transportation and loss of utilities.	1. High winds 2. Winter storm 3. Coastal flooding	Severe storm in Region 2 is a common event. Since 1956, severe storm events resulted in Presidential Disaster Declarations in 1962, 1974, 1979, 1990 (2 disasters), 1995, 1996, and 1997. Since 1989, Region 2 received more than $5.4 million in Stafford Act disaster assistance for repairs to public facilities following severe storm events.	Projected recurrence rates for the severe storm events to which Region 2 is most vulnerable are as follows: • High wind events occur at least once a year throughout the region. • Winter storms occur about twice every five years throughout the region. • Coastal flooding occurs about once every six years in coastal areas of the region.

Region 2

Hazard: Severe Storm **At Risk Population**: 322,447 of region total 322,447 **PRELIMINARY ASSESSMENT**

State Agency Structures At Risk Number and Function of Buildings	No. of Affected Staff / Visitors / Residents	Approx. Value of Owned Structures	Approx. Value of Contents All Structures
Total at-risk buildings: 83	1,368	$51,785,063	$31,104,401
Function of at-risk buildings:			
Total at-risk critical facilities: 48	832	$18,642,476	$24,314,691
Function of at-risk critical facilities:			

Hazard: Tsunami

Characteristics	Principal Sources	Event History	Probability
A tsunami is caused by sudden raising or lowering of the Earth's crust. A tsunami resembles a series of quickly rising tides that withdraw with currents much like those of a river. Swift currents commonly cause most of the damage. A Pacific Ocean tsunami can affect the entire Pacific basin, while a tsunami in inland waters can affect many miles of shoreline. Tsunamis typically cause the most severe damage and casualties near their source. Waves are highest there because they have not yet lost much energy. Another class of damaging water wave is a seiche. A seiche is a wave generated in a body of water from the passage of seismic waves caused by earthquakes. Sedimentary basins beneath the body of water can amplify a seismic seiche and the natural sloshing action in a body of water or focus water waves onto a section of shoreline.	Tsunamis and seiches can be generated by a number of sources: 1. Distant earthquakes along the Pacific Rim (i.e., 1964 Alaska earthquake). 2. Local earthquakes, such as those generated by local surface faults; in the Benioff zone; or in the Cascadia Subduction Zone off the coast. 3. Large landslides into bodies of water, such as Puget Sound or lakes. 4. Submarine landslides in bodies of water such as Puget Sound.	A.D. 900-930 – A magnitude 7+ earthquake on the Seattle fault, created uplift on the floor of Puget Sound. The uplift generated a tsunami that likely affected both Winslow and Gorst in Kitsap County. 1700 – The magnitude 9.0 Cascadia Subduction Zone earthquake is believed to have deposited a sand sheet in Discovery Bay in the eastern Strait of Juan de Fuca. 1960 – The M9.5 Chilean earthquake generated a tsunami with a wave height recorded at 1.2 feet at Neah Bay. 1964 – Wave heights for the tsunami generated by the M9.2 Alaska earthquake were 0.5 feet at the mouth of the Hoh River, 0.7 feet in Neah Bay, and 1.6 feet in La Push.	Great earthquakes in the North Pacific or along the Pacific coast of South America that generate tsunamis that sweep through the entire Pacific basin occur at a rate of about six every 100 years. Estimated recurrence rate of an earthquake on the Seattle fault of the size necessary to generate a tsunami or seiche is estimated at once every 1,100 years. Estimated recurrence rates for distant earthquakes that generate a tsunami or seiche have not been developed. Scientists developed tsunami inundation models and maps for the areas of Jefferson and Clallam Counties along the Pacific Coast and Strait of Juan de Fuca. These counties are developing evacuation plans and maps, and information campaigns for their citizens.

Region 2

Hazard: Tsunami **At Risk Population**: est. 82,407 of region total 322,447 **PRELIMINARY ASSESSMENT**

State Agency Structures At Risk Number and Function of Buildings	No. of Affected Staff / Visitors / Residents	Approx. Value of Owned Structures	Approx. Value of Contents All Structures
Total at-risk buildings: 24	512	$8,177,056	$6,218,825
Function of at-risk buildings:			
Total at-risk critical facilities: 14	467	$115,000	$4,082,885
Function of at-risk critical facilities:			

Hazard: Volcano

Characteristics	Volcanoes in Region	Event History	Probability
Region 2 does not have a resident volcano. However, it could be affected by ash fall from other volcanoes in Washington state or the Canadian province of British Columbia.	None. The closest volcanoes are Mount Baker and Glacier Peak in Region 1, and Mount Rainier in Region 5.	Mount Baker in Whatcom County erupted in the mid 1800s for the first time in several thousand years. Activity at steam vents near the summit increased beginning in 1975; an eruption is not imminent. The volcano is not showing signs of renewed activity. Glacier Peak in Snohomish County erupted at least six times in the past 4,000 years. Powerful eruptions 13,000 years ago deposited ash as far away as Wyoming. Since glacial times, Glacier Peak has had larger and more explosive eruptions than every other Washington volcano except Mount St. Helens. Mount Rainier in Pierce County has produced at least four eruptions and numerous lahars in the past 4,000 years.	The main hazard from nearby volcanoes would be from ash fall. Due to prevailing westerly winds, the possibility of an annual ash fall of one centimeter in Region 2 from volcanoes is as follows: • Mount Baker – 1 in 20,000. • Glacier Peak – Less than 1 in 100,000. • Any major Cascade volcano – ranges from 1 in 5,000 to 1 in 10,000.

Hazard: Volcano **At Risk Population**: Unknown of region total 322,447 **PRELIMINARY ASSESSMENT**

State Agency Structures At Risk Number and Function of Buildings	No. of Affected Staff / Visitors / Residents	Approx. Value of Owned Structures	Approx. Value of Contents All Structures
Total at-risk buildings: 0	0	0	0
Function of at-risk buildings:			
Total at-risk critical facilities: 0	0	0	0
Function of at-risk critical facilities:			

Hazard: **Wildland Fire**

Characteristics	Principal Sources	Event History	Probability
Wildland fires are fires caused by nature or humans that result in the uncontrolled destruction of forests, brush, field crops, grasslands, and real and personal property in non-urban areas. A fire needs three elements in the right combination to start and grow – a heat source, fuel, and oxygen. How a fire behaves primarily depends on the characteristics of available fuel, weather conditions, and terrain. The wildland fire season in Washington usually begins in early July and typically culminates in late September with a moisture event. Drought, snow pack, and local weather conditions can expand the length of the fire season.	1. Humans – people start most wildland fires; from 1992 to 2001, people, on average, caused more than 500 wildland fires each year on state-owned or protected lands. Human-caused fires burn an average of 4,404 state-protected acres each year. 2. Lightning – lightning on average started 135 wildland fires annually during 1992-2001. Lightning-caused fires burn more state-protected acreage than any other cause, an average of 10,866 acres annually.	1951 – Great Forks Fire burned 33,000 acres in Clallam County. Region 2 is part of the Olympic and South Puget Sound fire protection regions of the Washington Department of Natural Resources (these fire protection region also includes portions of three other planning regions). During 1992-2001, the Olympic and South Puget Sound regions averaged 254 fires a year that burned an average of 121 acres of state-protected lands (specific fire data for Region 2 is not available).	Nearly all of the state's significant wildland fires have occurred in Eastern Washington. Western Washington is less prone to catastrophic wildland fires than Eastern Washington – the east has more available fuel to burn (both lighter fuels that burn more easily and more snags and hazard trees), and weather conditions more favorable to fire (thunderstorms with dry lightning are more prevalent in the east). Also, the west has a shorter fire season than the eastern half of the state – the west receives more rainfall, has wetter and cooler spring seasons, and is more urbanized.

Region 2

Hazard: Wildland Fire **At Risk Population**: 34,600 of region total 322,447 **PRELIMINARY ASSESSMENT**

State Agency Structures At Risk Number and Function of Buildings	No. of Affected Staff / Visitors / Residents	Approx. Value of Owned Structures	Approx. Value of Contents All Structures
Total at-risk buildings: 66	1,271	$39,441,876	$30,712,830
Function of at-risk buildings:			
Total at-risk critical facilities: 46	785	$18,584,976	$24,021,095
Function of at-risk critical facilities:			

[1] *Clallam County Profile,* Washington Department of Employment Security, Labor Market and Economic Analysis Branch, December 2001.

[2] *Jefferson County Profile,* Washington Department of Employment Security, Labor Market and Economic Analysis Branch, July 2000.

[3] *Kitsap County Profile,* Washington Department of Employment Security, Labor Market and Economic Analysis Branch, January 2001.

[4] *Profile of Selected Economic Characteristics: Census 2000*, U.S. Census Bureau.

[5] *Traffic Statistics Rider Segment Report, January 1, 2002 through December 31, 2002*, Washington State Ferries.

[6] *Summary of Public Transportation 2001*, Washington State Department of Transportation, November 2002 (Revised April 2003).